ENTRY No. 54

NAME OF MACHINE CSIR PRETORIA CYCLOTRON DATE JULY 1981
INSTITUTION COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
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HISTORY AND STATUS

DESIGN, date 1950 Model tests –
ENG DESIGN, date 1951 - 1953
CONSTRUCTION, date 1953 - 1958
FIRST BEAM, date (or goal) 1958
MAJOR ALTERATIONS (see below)

COST, ACCELERATOR –
COST, FACILITY, total R200 000 (1958)
FUNDED BY CSIR

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS – ENGINEERS 1 (part-time)
TECHNICIANS 6 CRAFTS 2
GRAD STUDENTS involved during year 0
OPERATED BY – Research staff or 5 Operators
OPERATION 136 hr/wk, On target 110 hr/wk
TIME DISTR. in house 100 %, Outside 0 %
BUDGET, op & dev –
FUNDED BY CSIR

RESEARCH STAFF, not included above

USERS, in house 4 outside 3
GRAD STUDENTS involved during year –
RESEARCH BUDGET, in house –
FUNDED BY CSIR

MAGNET

POLE FACE, diameter (compact) 112cm, R extraction 49.5cm
R injection – cm
GAP, min 14.7 cm, Field 17.7 kG
max 15.9 cm, Field 16.4 kG
at 0.32×10^6 Ampere turns
AVERAGE FIELD at R ext 17.0 kG
B max/ <B> 1.04
NUMBER OF SECTORS compact 3, separated –; Spiral, max 0 deg
SECTOR ANGLE (SSC) – deg
TRIMMING COILS Two sets of circular coils and three harmonic coils
CONDUCTOR, material and type Aluminum
STORED ENERGY (cryogenic) 0.2 MJ
POWER : main coils 70 max, kW ; current stability 10^{-4}
trimming coils 2 max, kW ; current stability 10^{-3}
WEIGHT : Fe 73.8 tons ; coils 5.4 tons
COOLING system Demineralized Water
ION ENERGY (bending limit) E/A = 32 q^2/a^2 MeV/amu
(focusing limit) E/A = 15 q /a MeV/amu

ACCELERATION SYSTEM

DEES, number 2 ; angle 140 deg
BEAM APERTURE 5 cm ; DC Bias – kV
TUNED by, coarse MS fine VC,AUTO
RF 10.8 to 17.4 mHz, stable ± 10 p.p.m
Orb F 10.8 to 17.4 mHz
HARMONICS, RF/Orb F, used 1
DEE - Gnd, max 72 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) –
ENERGY GAIN, max 270 kV/turn
RF PHASE, stable to ± – deg
RF POWER input, max 40 kW
FREQUENCY MODULATION, rate – /s
modulator, type –
beam pulse, width –

VACUUM SYSTEM

OPERATING PRESSURE 50×10^{-6} Torr or mbar
PUMPS, No, Type, Size
2 Diffusion HV,
2 Roughing

ION SOURCES

Internal hot cathode source

INJECTION SYSTEM

–

EXTRACTION SYSTEM

DC. Electrostatic. Channel with 1st. Harmonic Bump.

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 150 m² ; movable 0 m²
TARGET STATIONS 4 in 1 rooms
STATIONS served at same time, max 2
MAG SPECTROGRAPH, type –
COMPUTER model –
OTHER FACILITIES
1. Isotope Production Facility
2. Fast Neutron Facility

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p	8	5.8 - 15.3	700	60
d	16	11.5 - 17.3	700	60
^{3}He		18 - 38	150	50
^{4}He	32	23 - 34.6	150	50
SECONDARY			(part/s)	
		–		
		–		

BEAM PROPERTIES

	MEASURED		CONDITIONS
PULSE WIDTH	RF deg	pμ A of	MeV ions
PHASE EXC, max 45	RF deg	100 pμ A of	16 MeV d. ions
EXTRACT eff	30 %	60 pμ A of	16 MeV d. ions
RESOL ΔE/E	– %	– pμ A of	– MeV – ions
EMITTANCE			
(π mm. mrad)	– axial, – rad	– pμA of	– MeV – ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 0% SOLID STATES PHYSICS 0%
BIOMEDICAL APPLICAT. 12% ISOTOPE PRODUCTIONS 78%
DEVELOPMENT 10%

REFERENCES/NOTES

Nucl. Inst. & Meth., 3 , 323 (1958)
Nucl. Inst. & Meth., 8 , 261 (1960)

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

During 1960 Thomas shims were installed in order to improve the vertical focussing.

The cyclotron has been modified for variable energy operation and for acceleration of ^{3}He-ions during 1969. A ^{3}He-recovering system has been installed.

Two magnetic channels will be installed in the near future to improve the focussing of the extracted beam.